

CAN GRAZING CONTROL GRASSHOPPERS?

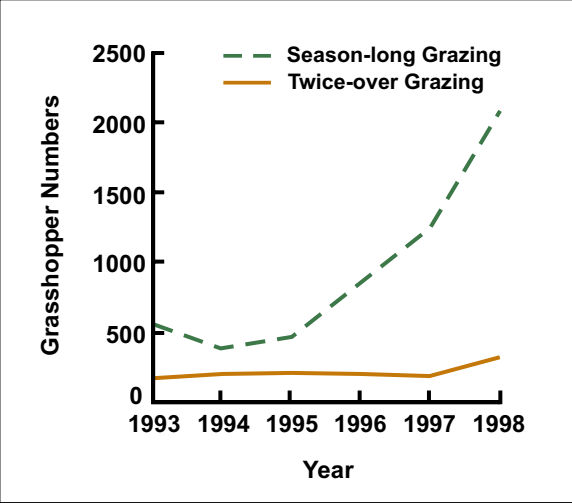
Although overgrazing by livestock is known to lead to increased grasshopper problems, it's possible that grazing management systems may actually be a key to reducing these problems. Recent ARS research is generating support for that hypothesis.

Scientists have found that twice-over rotation pastures average 70% fewer grasshoppers when compared to season long grazing pastures (see graph). Why? Most pest grasshoppers thrive and grow faster when there are many small patches of bare soil which are ideal sites for grasshoppers to absorb energy from the sun. Researchers believe that twice-over grazing causes grass to tiller, which closes up those bare spots and slows the growth rates of many pest species. This slower growth rate likely results in higher death rates for the developing grasshoppers, fewer adults, and less time for the surviving adults to lay eggs for the next year.

Typical grasshoppers go through 5 stages before becoming adults, with the largest stages eating the most vegetation. Consequently, if one can reduce the time that grasshoppers are in the larger stages by slowing their development — one can reduce the impact that grasshoppers have on rangeland. Although the research is continuing, habitat differences brought about by grazing patterns clearly appear to be a key in controlling grasshoppers.



ARS entomologist David Branson samples grasshoppers in a grazing plot near Miles City, MT.



Grasshoppers were much less abundant in twice-over rotational grazing pastures than in season-long grazing pastures, even in years when grasshoppers were a problem.

Additional studies are underway to examine a wide range of other grazing systems to determine how often grazing can be used to keep grasshopper populations at acceptable levels. ARS scientists in Sidney and Miles City, Montana, together with university researchers, are conducting large-scale, long-term studies at four locations in the Great Plains to find out how different grazing systems affect grasshopper populations over time. These studies involve sites in North Dakota, Montana and Nebraska. ARS researchers are also using cages in small-scale studies to examine how changes in both the timing and intensity of livestock grazing affect rangeland quality, as well as grasshopper survival and reproduction.

While several more years of research are needed, these studies may ultimately provide land managers with new tools that have been shown to be successful under field conditions.

FOR MORE INFORMATION

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The grasshopper research program at the Northern Plains Agricultural Research Laboratory (NPRL) in Sidney, MT consists of four scientists: Two entomologists, an ecologist and a pathologist. In addition to their work in the northern Great Plains, NPRL specialists are also leading a cooperative grasshopper research project in Alaska.

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The USDA-ARS Northern Plains Agricultural Research Laboratory in Sidney, MT, is charged with conducting research to develop and transfer solutions to agricultural problems that will enhance profitability and environmental quality for producers on the Northern Great Plains. It emphasizes soil and water stewardship and the biological and cultural management of insects, pathogens, and weeds.



United States Department of Agriculture
Agricultural Research Service



GRASSHOPPER MANAGEMENT



Grasshoppers feeding on crested wheatgrass.
• Photo by Jack Dykinga

An Integrated Approach

U. S. Department of Agriculture
Agricultural Research Service
Northern Plains Agricultural Research Laboratory

GRASSHOPPERS: CAN WE PREVENT OUTBREAKS?

Over the years, grasshopper outbreaks have often plagued farmers and ranchers in the Great Plains, competing with livestock, wildlife and humans for food supplies. The most memorable examples occurred in the 1860s and again in the 1930s when grasshoppers were so abundant they ate practically everything, including the paint off barn walls. Under more typical circumstances, grasshoppers consume an estimated 21-23% of the average annual range forage production, a lot, but maybe not as damaging as it first appears (See "Beneficial Grasshoppers?!"). However, about every 8-10 years, extensive outbreaks can decimate range vegetation and lead to a mass migration to cultivated crops.

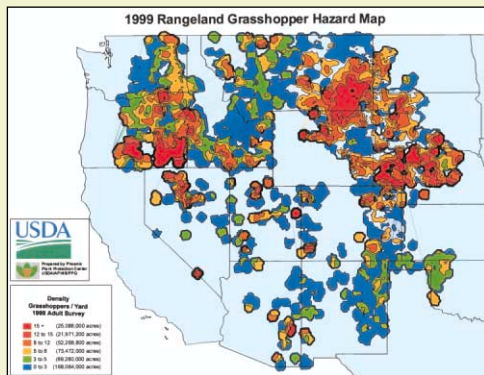
In Great Plains rangelands, grasshopper densities tend to increase with drought and grazing intensities, and severe local outbreaks can occur every year. Major grasshopper outbreaks tend to occur during hot, dry weather cycles which lead to drastically reduced range vegetation and increased grasshopper numbers. The grasshoppers then compete with livestock and wildlife for the remaining vegetation.

In the past, pesticides have been the primary tools used to combat grasshopper outbreaks on rangeland, with major infestations often controlled by large cooperative spray programs. During the last major outbreak, USDA/APHIS sprayed a record 13 million acres of public and private land at a total cost of about \$25 million.

A similar effort is unlikely to be undertaken today. A lack of government funding and increased environmental concerns and regulations (particularly on public lands) have combined to put a damper on such spraying efforts. Traditional pesticide use appears to be economical on only about 40% of U.S. rangeland even in severe outbreaks, according to economic models.



Spraying pesticides on rangeland during a 1963 outbreak.



USDA-APHIS annual grasshopper surveys have been used to predict grasshopper outbreaks. The red color in the map above indicates high densities.

Recently, new approaches have been developed which increase the distance between sprayed swaths while still providing good grasshopper control and cutting application costs by as much as 50 to 60 percent. However, the economic realities of low livestock and commodity prices have made it difficult for any grasshopper spraying to be profitable. But what if producers and land managers were able to reduce grasshopper problems without resorting to pesticides?

Building toward a solution

Until recently, little has been done in the line of preventative grasshopper management; that is, to delay, shorten or reduce the area or intensity of outbreaks before they overwhelm farm and ranch operations. That is changing. Today, ARS scientists at the Northern Plains Agricultural Research Laboratory in Sidney, Montana are developing new management tactics for controlling periodic grasshopper outbreaks in a cost effective and environmentally friendly fashion. The research effort has a three-pronged approach.

The first focuses on how grazing management can reduce grasshopper outbreaks. That effort has already met with some success. ARS researchers have been examining how the timing and intensity of livestock grazing under a

twice-over rotational system leads to a significant reduction in grasshopper numbers when compared to a season long grazing system. (See "Can Grazing Control Grasshoppers?")

The second research effort examines under what conditions grasshoppers can increase or decrease rangeland vegetation by their effects on nutrient recycling. This will help determine when grasshopper control is a good idea and how grasshoppers impact the sustainability of grazing on rangeland.

The third approach looks at



These cages allow ARS researchers to study grasshopper outbreaks and interactions between grazing and grasshoppers under a variety of controlled conditions.

what conditions, such as weather and existing grasshopper densities, lead to larger grasshopper outbreaks, as well as how habitat manipulation, predators and disease might be better used to limit them.

Although additional studies are needed, this research points the way toward practical and affordable management techniques for the future.

The future

The goal of ARS personnel is to develop a sustainable grasshopper management system that uses management practices and ecological processes in place of nonrenewable resources such as pesticides. ARS scientists want to develop a system that can maintain or improve range conditions, while decreasing the impact of periodic grasshopper outbreaks.

Two research positions have been added at the Sidney lab to aid that effort. One scientist will explore the role grasshopper diseases and pathogens play in reducing outbreaks. The other will examine how variations in range plants, particularly under drought conditions, contribute to outbreaks and grasshopper movement to crops.

Ultimately, this research effort will provide both public and private land managers with affordable and environmentally friendly alternatives for grasshopper management. In the future, these management strategies may be the only viable control tactics available for use on significant amounts of rangeland.



Testing pathogen effects on grasshoppers.

This eye-catching grasshopper was found in a grazing plot near Sentinel Butte, ND.

BENEFICIAL GRASSHOPPERS?!

Of nearly 400 known grasshopper species in the Western United States, only about two dozen are considered serious pests. Another dozen are considered somewhat beneficial since they eat undesirable range plants. While it's true that grasshoppers can frequently consume almost a quarter of average annual range forage production, surprisingly that isn't all bad. Since grasshoppers only digest around 12-21% of what they eat from growing plants, much of what they consume is returned for valuable nutrient recycling. Consequently, in low to moderate numbers, grasshoppers may be beneficial under certain circumstances.

Moderate grasshopper populations are beneficial in other ways as well. For example, they are an important food source for other desirable species found on the prairies, including many songbirds, game birds and small mammals. Those predators, along with pathogens and parasites, can help keep grasshopper populations low most of the time. Eradication of all grasshoppers would have an unfavorable impact on the food supply for these desirable species, another reason preventative management is a key component of the ARS grasshopper control effort.



Many birds rely on grasshoppers for a large portion of their diet.

• Photo by Kelly Krabbenhoft